(g) In the event that the Response Station Hub permittee or licensee and ITFS licensee are unable to resolve a brute force overload event within 15 days from the date of the tests demonstrating such problem, the ITFS licensee may file a complaint with the Commission specifying the nature of the problem. The complaint must be served on the Response Station Hub permittee or licensee, who shall have 10 days to respond. The ITFS licensee shall have five days to file a reply. While the complaint is pending, the response station at issue may not be activated except for additional testing by agreement of both parties.

Part 74 Rules

§ 74.___. *Installation Procedures for Response Station Transmitters.* Applicants, permittees and licensees of Response Station Hubs must comply with the following requirements for response stations associated with each hub.

(a) An applicant for response station hub authorization must certify that:

(i) All response station transmitters will be at fixed locations. No mobile, portable or itinerant equipment will be permitted to be used with the hub.

(ii) All response station transmitters will utilize directional transmitting antennas.

(iii) All response station transmitting antennas will be installed by qualified technicians. No customer-installed equipment will be permitted.

(b) Response stations will be limited to a transmitter power output (TPO) of no greater than +33 dBm (2 Watts) and an EIRP of no greater than +48 dBm (63 Watts), as adjusted for the actual bandwidth used by the response station transmitter.

Note: For example, a response station transmitter employing a bandwidth of 3 MHz would have to reduce its allowable TPO and EIRP by 3 dB [10 $\log_{10}$ (3 MHz/6 MHz)]; a response station transmitter employing a bandwidth of 1 MHz would have to reduce its allowable TPO and EIRP by 7.8 dB [10 $\log_{10}$ (1 MHz/6 MHz); a response station transmitter employing a bandwidth of 100 kHz would have to reduce its allowable TPO and EIRP by 17.8 dB [10 $\log_{10}$ (0.1 MHz/ 6 MHz)].

§ 74.___. *Protection of ITFS Receive Sites from Brute Force Overload.* Permittees and licensees of Response Station Hubs must make every effort to

protect ITFS receive sites from brute force overload, or blanketing interference. In addition to other requirements specified in these rules, permittees and licensees of Response Station Hubs must take the steps set forth below. For purposes of this section, each existing and previously proposed ITFS receive site shall be deemed to have the "notification zone" and "equipment test zone" identified in Figure 1.

(a) Prior to installation of any response station transmitter within 1960 feet of an ITFS receive site, the permittee or licensee of the Response Station Hub must send a notice, by certified, return receipt U.S. mail, to the affected ITFS applicant or licensee regarding the location of the proposed response station. This "notification zone" is specified in Figure 1.

(b) A Response Station Hub permittee or licensee will not be permitted to locate a response transmitter within the Equipment Test Zone outlined in Figure 1, unless it has completed tests to establish that no blanketing interference is caused to any ITFS receive site.

(c) If a Response Station Hub permittee or licensee intends to locate a response station within the Equipment Test Zone, the Response Station Hub permittee or licensee must notify the licensee of the ITFS receive site that it desires to conduct tests of blanketing interference at least 30 days prior to the date on which it would like to turn the response station equipment over to the customer. It is the responsibility of the Response Station Hub permittee or licensee to contact the ITFS licensee to arrange a date for testing. In the event that the ITFS receive site is merely proposed or otherwise not operational, the ITFS licensee shall have the right to follow the procedures set forth in paragraph (g) below within 30 days of the date the receive site becomes operational if brute force overload is present.

(d) For any such tests, all existing response stations within the entire notification zone must be on the air during the test to ensure that the worst case total power to the first active device of the downconverter is tested, or, alternatively, the tests must be performed at 6 dB in excess of the power proposed for the response station.

(e) The Response Station Hub permittee or licensee must send a certified report of the test results to the ITFS licensee. If the test results are negative, and the hub permittee or licensee intends to install the response station at the site, then it must deliver the certification to the ITFS licensee prior to the date for customer acceptance of the equipment. If the tests demonstrate a brute force overload event, the Response Station Hub permittee or licensee may not turn the equipment over to the customer until such event is resolved.

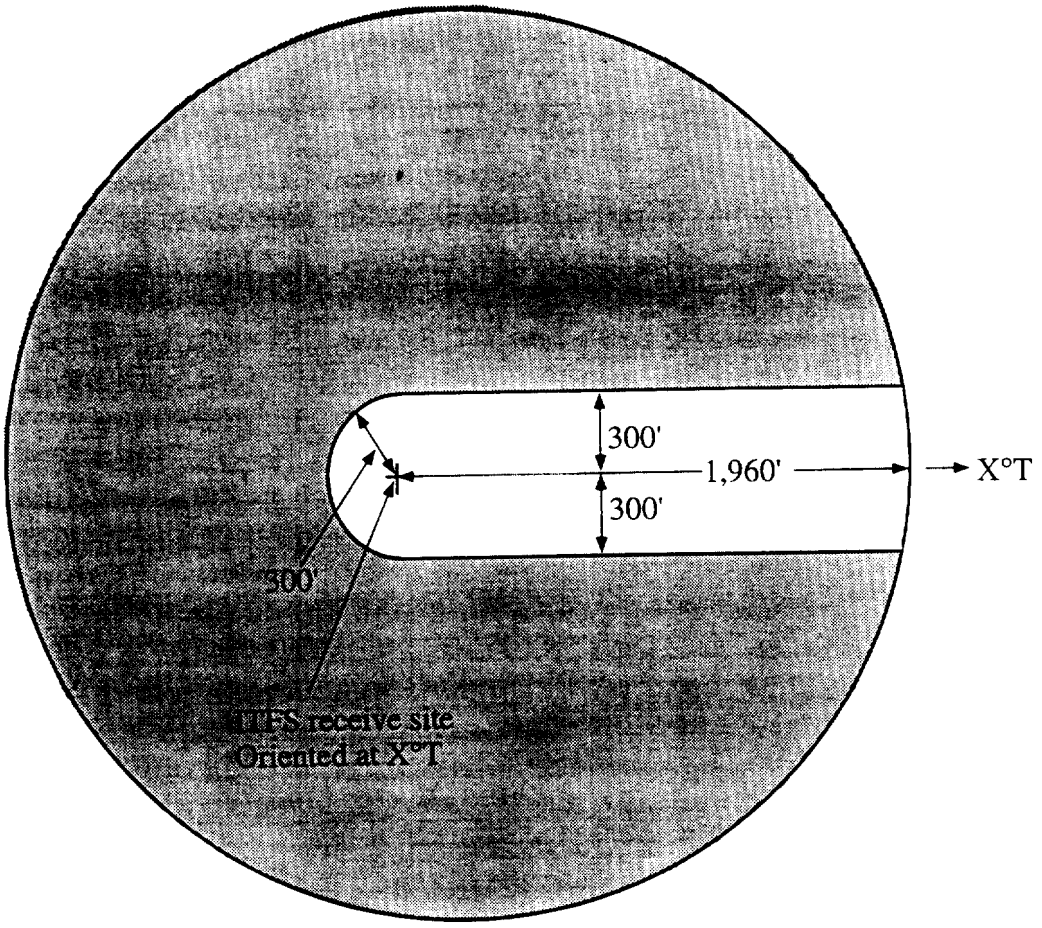
(f) For purposes of testing, brute force overload would be considered to exist if greater than a 1 dB degradation in the carrier-to-noise (C/N) ratio of the

ITFS signal was observed when the response station was activated. In the event that test demonstrated the presence of brute force overload, the Response Station Hub permittee or licensee must take all necessary steps to resolve the problem to the satisfaction of the ITFS licensee.

(g) In the event that the Response Station Hub permittee or licensee and ITFS licensee are unable to resolve a brute force overload event within 15 days from the date of the tests demonstrating such problem, the ITFS licensee may file a complaint with the Commission specifying the nature of the problem. The complaint must be served on the Response Station Hub permittee or licensee, who shall have 10 days to respond. The ITFS licensee shall have five days to file a reply. While the complaint is pending, the response station at issue may not be activated except for additional testing by agreement of both parties.

Catholic Television Network

Proposed Notification and Equipment Test Zones



Not to Scale.

Notification zone
Notification and Equipment Test zone

III. RULES FOR PROCESSING TWO-WAY SERVICE APPLICATIONS

Part 21 Rules

§ 21.27(d). Applications for booster stations, response station hub authorizations and associated modifications to existing stations in the Multipoint Distribution Service proposing two-way services may be filed on the first five business days of every month, as defined in Section 1.4; and, all applications filed on those days in each month shall be deemed to have been filed as of the same day for purposes of §§ 21.909 and 21.913. Applications filed in one month shall cut-off applications that are filed during a subsequent month for facilities that would cause harmful electromagnetic interference. Except as otherwise specified in Subpart K, an MDS transmitting station and response station hub shall not be entitled to protection from interference caused by facilities proposed in a month prior to the day the application for the station or hub is filed, and an MDS station shall not be required to protect from interference the facilities of other stations or hubs proposed after the month in which the application for the station authorization is filed.

§ 21.27(e). Applications for Response Station Hubs in the Multipoint Distribution Service shall be granted on a provisional basis prior to final authorization. Each permit for a Response Station Hub shall authorize construction and operation of the hub and associated response station transmitters. Upon completion of construction, each permittee is required to file a certification of completion of construction and commencement of service. Such certification shall be served, by certified, return receipt U.S. mail, on every ITFS licensee and applicant with a registered or proposed receive site within 35 miles of the Response Station Hub. The permittee may file for a final authorization 180 days after filing such certification, and must state that there have been no complaints of harmful interference as a result of operation of the Response Station Hub and associated response station transmitters, or that any such complaints have been resolved between the parties.

Part 74 Rules

§ 74.911(e). Applications for booster stations, response station hub authorizations and associated modifications to existing stations in the Instructional Television Fixed Service proposing two-way services may be filed on the first five business days of every month, as defined in Section 1.4; and, all applications filed on those days in each month shall be deemed to have been filed as of the same day for purposes of §§ 74.939 and 74.985. Applications filed in one month shall cut-off

applications that are filed during a subsequent month for facilities that would cause harmful electromagnetic interference. Except as otherwise specified in this subpart, an ITFS transmitting station and response station hub shall not be entitled to protection from interference caused by facilities proposed in a month prior to the day the application for the station or hub is filed, and an ITFS station shall not be required to protect from interference the facilities of other stations or response station hub proposed after the month in which the application for the station authorization is filed.

§ 74.911(f). Applications for Response Station Hubs in the Instructional Television Fixed Service shall be granted on a provisional basis prior to final authorization. Each permit for a Response Station Hub shall authorize construction and operation of the hub and associated response station transmitters. Upon completion of construction, each permittee is required to file a certification of completion of construction and commencement of service. Such certification shall be served, by certified, return receipt U.S. mail, on every ITFS licensee and applicant with a registered or proposed receive site within 35 miles of the Response Station Hub. The permittee may file for a final authorization 180 days after filing such certification, and must state that there have been no complaints of harmful interference as a result of operation of the Response Station Hub and associated response station transmitters, or that any such complaints have been resolved between the parties.

ATTACHMENT 2

JOINT ENGINEERING STATEMENT

DENNY & ASSOCIATES, P.C.
CONSULTING ENGINEERS
WASHINGTON, D.C.

JOINT ENGINEERING STATEMENT IN SUPPORT OF THE COMMENTS OF CATHOLIC TELEVISION NETWORK ON EX PARTE COMMENTS IN MASS MEDIA DOCKET 97-217

INTRODUCTION

This Engineering Statement has been prepared by the firms of John F. X. Browne and Associates, P.C.; Denny & Associates, P.C.; and Hammett & Edison, Inc. on behalf of the Catholic Television Network (hereinafter CTN) pursuant to the Federal Communications Commission June 12, 1998, Public Notice[1] establishing an additional comment period in Mass Media Docket Number 97-217. This statement addresses only those *ex parte* presentations made after February 9, 1998, with particular emphasis on the petitioner's filings submitted on May 13, 15, 19, and 22, 1998, and on June 5, 1998.

[1] Public Notice, DA 98-119, released June 12, 1998, establishing a 20-day comment period on *ex parte* presentations and filings in Mass Media Docket Number 97-217 made after February 9, 1998.

BACKGROUND

The Joint Engineering Exhibits filed in support of CTN's Comments and Reply Comments in this proceeding identified three technical aspects of the petitioner's proposal that will prove detrimental to the Instructional Television Fixed Service (ITFS). These are brute force overload (BFO), cochannel and adjacent channel interference, and the preclusive nature of the petitioner's base stations or so-called Response Station Hubs (RSH).

The concerns of CTN's engineers, which are explained fully in the previously filed Joint Engineering Exhibits, may be summarized as follows. BFO of an existing ITFS receive site can result when a new type of station proposed by the petitioner called a *response station* is located too close to an existing ITFS receive site regardless of the response station's operating frequency. CTN's engineers determined that, based on information provided by the petitioner, that BFO of an existing ITFS receive site could occur if a response station were located within 597.4 meters (1960 feet) and that the potential for BFO of an ITFS receive site would be significantly greater if the response station were located within 91.4 meters (300 feet) and within 91.4 meters of the centerline of the main lobe of an ITFS directional receiving

antenna out to a maximum distance of 597.4 meters. To allow ITFS licensees to evaluate the impact of a new response station on existing ITFS receive sites, CTN proposed that ITFS licensees be notified of all new response stations to be constructed within 597.4 meters of an existing ITFS receive site and testing be required of those proposed response stations most likely to cause BFO to existing ITFS receive sites prior to commercial activation of the response station.

CTN's engineers are concerned with cochannel and adjacent channel interference to ITFS receive sites from response stations because of the petitioner's overly complex interference prediction methodology that is based upon a totally unrealistic assumption regarding the geographic distribution of response stations. To alleviate its concerns of cochannel and adjacent channel interference to ITFS receive sites from response stations, CTN has proposed that response stations be prohibited from operating on cochannel and adjacent frequencies within its protected service area (PSA) without the concurrence of the potentially affected ITFS licensees.

Finally, CTN's engineers are concerned with the preclusive effects of RSHs. Unlike the highly directional receive antennas used in the ITFS,

the petitioner proposes to configure RSHs with omnidirectional or sectorized receiving antennas. The use of omnidirectional receiving antennas at RSHs will preclude virtually any improvement or expansion of an existing ITFS system or deployment of a new ITFS facility within the radio horizon of a cochannel or adjacent channel RSH. CTN continues to note that prohibiting response station operation on cochannel and adjacent channel frequencies also has the advantage of eliminating the preclusive effects of RSHs on ITFS system development.

CTN's engineers have reviewed the petitioner's *ex parte* filings and found no substantive relief in any of the three areas of concern identified. A discussion of CTN's continuing technical concerns in the areas of BFO, interference, and preclusion in light of the petitioner's *ex parte* filings follows.

BRUTE FORCE OVERLOAD

None of the revisions advanced by the petitioner has adequately addressed CTN's BFO concerns. CTN repeatedly has made the point that ITFS's use in the classroom is contingent upon the provision of reliable service. If a teacher incorporates ITFS programming into the day's activities and interference interrupts or prevents the delivery of the program, then that

instructional time is not used efficiently. Once a teacher determines that ITFS is not reliable, then alternative means of instruction will be used.

Because reliability is such an important concern, ITFS operators cannot afford to wait and see if response station deployment causes BFO. As a practical matter, end users simply will conclude that there is a problem with the ITFS resource. Even if the malfunction is reported, most schools lack the technical resources necessary to identify BFO expeditiously.

Section 74.939(f)(7) of the petitioner's proposed FCC Rules states that in the event of block downconverter overload or BFO of an existing ITFS receive site, the licensee of the RSH with a response service area within five miles of an affected ITFS receive site will cooperate in good faith only to expeditiously identify the source of the interference. The text then goes on to make clear that this proposed rule would apply only to those ITFS receive sites registered prior to the submission of the application for the RSH and to describe the means by which the cost of remediation shall be apportioned amongst RSH licensees. The language of the proposed rule indicates that future ITFS receive sites would not receive protection from BFO, even though

the locations of the existing response stations that pose a threat of BFO would not be known to the ITFS licensee seeking to add a new receive site.

The petitioner's proposed rule with respect to BFO is inadequate with respect to technical concerns because it does not allow evaluation of the potential for BFO prior to response station deployment, because it does not propose to shut down interfering response stations immediately, and because it does not protect those ITFS receive sites registered after an application is filed for an RSH. By proposing after-the-fact interference resolution, the ITFS licensee must bear the burden of identifying the cause and the source of the interference. As response stations will operate intermittently and are likely to use a digital, noise-like modulation scheme, identification of BFO will be time consuming and costly for the ITFS operator, especially one lacking the sophisticated test equipment and personnel skilled in interference resolution.

COCHANNEL AND ADJACENT CHANNEL INTERFERENCE

The petitioner continues to propose use of a complex methodology for predicting interference to ITFS receive sites from response stations. Further, the petitioner's proposed interference prediction methodology is

based on an assumption of a uniform distribution of response stations, an assumption that will not be borne out in the real world. Finally, the petitioner's proposed methodology underpredicts the interference caused to cochannel and adjacent channel ITFS receive sites located inside a response service area (RSA).

It would appear that the location, size, and shape of an RSA could be specified so that the petitioner's proposed interference prediction methodology, based on the assumption of a uniform distribution of response stations, would lead to a conclusion of no interference to nearby ITFS facilities. However, if the RSA were drawn in such a way that it enclosed both a small area in which a virtually all of the response stations would be deployed and a much larger area in which no response stations would be deployed, the interfering response stations would be clustered in a manner not anticipated by the petitioner's methodology. Under this scenario, interference to ITFS receive sites could occur contrary to the prediction of no interference made using the petitioner's methodology and the petitioner's assumption of a uniform distribution of response stations.

In addition to the error introduced in the prediction of interfering signal strength that will result from the assumption of a uniform distribution of response stations, the petitioner's interference prediction methodology fails to account for ITFS receive sites located inside the RSA. If an ITFS receive site were located inside an RSA, it would be possible for the size and shape of the RSA to be such that a sufficient distance could exist between the analysis line and the ITFS receive site so that use of the petitioner's methodology would result in a false prediction of no interference to ITFS reception. For example, given a large RSA, it would be possible to show a 0 dB desired-to-undesired signal strength ratio (D/U) between the analysis line and the ITFS receive site when, in actuality, response stations were located within the main lobe of the ITFS receive antenna. It even would be possible for the response station antennas to be oriented toward the front of the ITFS receiving antenna if the RSH were located behind the ITFS receive site.

To eliminate all concerns of response station interference to present and future ITFS receive sites, CTN continues to propose use of a 6 megahertz (MHz) guard band between upstream response station transmissions and downstream ITFS transmissions within 56.3 kilometers (35 miles) of the ITFS transmitter.

PRECLUSIVE EFFECT OF RESPONSE STATION HUBS

The RSH protection sought by the petitioner continues to be so great that expansion of existing ITFS facilities and deployment of new ITFS facilities within the radio horizon will be precluded. The petitioner's proposed revisions to its proposed Section 74.939(h) of the Rules requires an applicant for a new or modified ITFS station to demonstrate the protection of all RSHs within 160.93 kilometers (100 miles). The petitioner defines *protection* as not increasing the effective power flux density (signal strength) of an undesired ITFS signal at the RSH antenna. In other words, an existing ITFS station cannot increase radiation in the direction of any RSH within 160.94 kilometers. This effectively precludes virtually all improvements to those existing ITFS stations that are required to protect RSHs. Even the replacement of an existing ITFS antenna with an antenna with slightly different horizontal plane radiation characteristics could require the ITFS station to reduce power to prevent increasing its signal strength at the RSH.

The situation is even worse for those institutions wishing to construct new ITFS facilities with 160.93 kilometers of an existing RSH. The petitioner proposes that new ITFS stations shall not increase the noise floor

at an existing RSH by more than 1 dB for cochannel stations and 45 dB for adjacent channel stations. The petitioner defines the noise floor in the absence of undesired ITFS signals as –136.2 dBW which is the thermal noise floor at 63 degrees Fahrenheit for a six-megahertz bandwidth. In other words, in the absence of interference, the petitioner proposes that new cochannel ITFS facilities not be permitted to increase the noise floor by more than 1 dB above that of thermal noise. By restricting the increase of the effective power flux density at an RSH to the extent proposed, the petitioner effectively precludes cochannel ITFS operation within 160.94 kilometers of a RSH.

Using the petitioner's methodology to convert thermal noise power to effective power flux density[2] in the absence of other interference, a new cochannel ITFS facility could not increase the effective power flux density at an existing RSH above –129.7 dBW/m^2, and a new adjacent channel ITFS facility could not increase the effective power flux density at an existing RSH above –85.7 dBW/m^2. The effective power flux density of an ITFS station operating with an effective isotropic radiated power of 2000 watts will reach -129.7 dBW/m^2 at a distance of 38,540 kilometers (23,948 miles) and

[2] Assuming cable losses of 3 dB, a noise figure of 3.5 dB, and receiving antenna gain of 12 dBi.

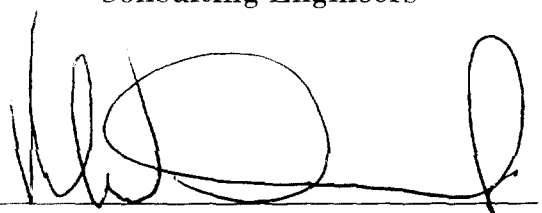
-85.7 dBW/m^2 at a distance of 243.2 kilometers (151.1 miles). Thus, cochannel ITFS operation is precluded within the radio horizon and adjacent channel ITFS operation is precluded either within 243.2 kilometers (more than four times the diameter of an ITFS PSA) of an existing RSH or within the radio horizon, whichever presents the shorter distance.

Under the petitioner's proposal regarding the protection of existing RSHs, current ITFS licensees will be virtually precluded from expanding their facilities and new cochannel ITFS operations will be precluded within the radio horizon of an existing RSH and new adjacent channel ITFS operations will be precluded within the closer of 243.2 kilometers or the radio horizon of an existing RSH. Clearly, ITFS expansion and development will be stymied unless RSHs are prohibited from operating in the vicinity of a cochannel or adjacent channel ITFS system without the concurrence of the ITFS licensee.

CERTIFICATIONS

We declare under penalty of perjury that the foregoing is true and correct. Executed on July 2, 1998.

John F. X. Browne, P.E.
John F.X. Browne & Associates, P.C.
Consulting Engineers



Robert W. Denny, Jr., P.E.
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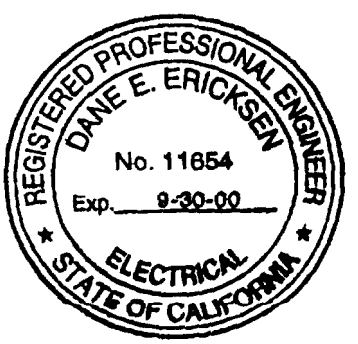

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ATTACHMENT 3

QUESTIONS AND ANSWERS ON FREQUENCY SEPARATION

Archdiocese of Los Angeles
Questions and Answers on
Frequency Separation ("Guard Band") Proposal
MM Docket No. 97-217
June 9, 1998

The Archdiocese of Los Angeles is a member of the Catholic Television Network (CTN), an association of 18 Roman Catholic Dioceses and Archdioceses. CTN has proposed that the Commission require a 6 MHz "guard band" to separate frequencies used for downstream ITFS transmissions (*i.e.*, traditional point-to-multipoint programming) from those used for upstream response station transmissions (*i.e.*, multipoint-to-point communications originated by subscribers or ITFS receive sites). This document responds to a number of questions that have arisen regarding CTN's proposal.

Q. **Why does CTN believe a guard band is necessary?**

A. CTN's guard band proposal is designed to preserve the assurance of interference-free ITFS operation that has traditionally been provided by pre-grant engineering review. CTN's engineers have demonstrated that there is a significant threat of interference to ITFS receive sites from the operation of a large number of response station transmitters at undisclosed locations. Because the locations of MDS response station transmitters are unknown, neither the Commission nor affected licensees can adequately evaluate in advance whether the deployment of these transmitters will cause interference. Since CTN's proposal guarantees that downstream ITFS programming will be separated by at least 6 MHz from upstream communications, response station transmitters will be incapable of causing co-channel or adjacent-channel interference to ITFS facilities.

Moreover, CTN's engineers have shown that the requirement to protect response station hub receivers will have a preclusive effect on ITFS licensees' ability to modify and expand their facilities after the deployment of a two-way system. The requirement to protect response station hubs is unlike any requirement in the present rules because these hubs may be omnidirectional, highly sensitive receivers. CTN's guard band proposal eliminates this preclusive effect by ensuring that ITFS programming is not transmitted on frequencies adjacent to those received by a response station hub.

Q. **Isn't a guard band spectrally inefficient?**

A. No. This misperception arises from ambiguity in the term "guard band." As proposed by CTN, the "guard band" is not unused spectrum. It is a 6 MHz band separating ITFS downstream communications from upstream response station transmissions. The guard band

has potential uses, including the transmission of commercial MDS downstream communications. Such communications could originate from primary transmitters, booster stations, or response station hubs, and could be transmitted on either MDS channels or leased ITFS channels.

Q. **If CTN believes that interference will occur to ITFS licensees, why won't MDS licensees face the same problem?**

A. The interference threat to an ITFS licensee arises from the deployment of response station transmitters with unknown characteristics at unknown locations. By contrast, a wireless cable operator knows the characteristics and locations of all response station transmitters it deploys. It has both the incentive and the ability to avoid causing interference to its own commercial downstream transmissions. It may be possible for the wireless cable operator to design a two-way system that will avoid adjacent-channel interference. The wireless cable operator who benefits from such a design should also bear the risk that its design will fail in practice. CTN's proposal merely places the risk of interference where it belongs, on the wireless cable operator, and not on adjacent-channel ITFS licensees.

Q. **Won't a guard band be restrictive and inflexible?**

A. No. Frequency separation is highly flexible and adaptable to different market configurations. For example, in any two-way market, some portion of the spectrum must be used for commercial downstream communications to MDS subscribers. Frequency separation can be assured simply by placing channels used for upstream communications adjacent to these commercial downstream channels, and not adjacent to channels used for ITFS downstream operations.

Q. **Can ITFS licensees use their frequencies for two-way communications under CTN's proposal?**

A. Yes. An ITFS licensee can "turn around" one or more of its licensed channels for upstream communications with the consent of the adjacent-channel licensee. The accompanying Figure 3 illustrates such a configuration. Because an ITFS licensee may only deploy response station transmitters co-located at its registered receive sites, the risk of interference is extremely low, as Petitioners contend. *See* Proposed Section 74.939(a) and Letter to Magalie Roman Salas from Paul J. Sinderbrand at 6 (Apr. 27, 1998). Since an ITFS licensee's response stations are deployed with known characteristics at known locations, the consent of an adjacent-channel licensee should be easy to obtain, and is a much different matter than consent to the blanket deployment of MDS response stations.

In addition, an ITFS licensee can take advantage of two-way communications through an agreement with a wireless cable operator who deploys a market-wide two-way system. For example, an ITFS licensee's excess capacity lease agreement could provide for carriage of the licensee's upstream communications on the wireless cable operator's upstream frequencies. Alternatively, the agreement could provide for partial compensation to the ITFS licensee in the form of free or discounted access to the wireless cable operator's two-way services.

Q. **How would CTN's guard band proposal work in practice?**

A. The accompanying figures illustrate three possible configurations.

Figure 1 illustrates a market in which a single wireless cable operator licenses or leases capacity on all channel groups (MDS 1 and 2/2A are not depicted), with no grandfathered E or F ITFS licensees. Assuming that each ITFS licensee reserves one of its licensed channels for educational programming to receive sites, CTN's proposal restricts the use of only three channels (B3, C2, and H3), and permits the wireless cable operator to accumulate the immense total of 136 MHz of upstream transmission capacity. In practice, much of this capacity would undoubtedly be used for MDS downstream transmissions to subscribers.

Figure 2 illustrates a market in which an MDS licensee of the E and F Groups wishes to deploy a two-way system on its own, without the cooperation of any of the ITFS licensees in the area. Two channels (E1 and F4) would be restricted to downstream communications, while the remaining 6 channels -- 75 percent of the spectrum -- would be available for upstream use. Ordinarily, the bandwidth required for downstream communications will be much greater than the bandwidth required for upstream communications, so this allocation clearly will satisfy market demand.

Figure 3, as described above, illustrates the deployment of a two-way system by an ITFS licensee using its own licensed frequencies with the consent of an adjacent-channel licensee.

Q. **What about other proposals for preventing interference?**

A. Frequency separation is superior to other proposals for resolving the interference that is predicted to arise from two-way deployment

- Frequency separation is *more flexible* than restricting upstream communications to a specific area of the ITFS and MDS spectrum, such as MDS channels 1 and 2/2A, since it permits a band plan to be tailored to individual market circumstances.

- Frequency separation is *less expensive* than placing a strict emission mask requirement on upstream transmitters, since subscriber equipment need not contain elaborate filters.